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ABSTRACT

This paper reports on a study of issues teacher educators face as they attempt to integrate technology into their instructional program: (1) the support they receive for use of technology, (2) their expectations of students to use technology, (3) their personal use of technology, (4) their knowledge of national, state, and local technology standards and requirements, and (5) their integration of technology standards into their instructional practice. The population was teacher educators who were integrally involved in preservice teacher education programs in 12 colleges/schools of education in two rural northwestern states. Areas of strength and areas of need for integration of ISTE (International Society for Technology in Education) Foundation Standards into teacher education programs were identified. (Author/AEF)

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Integration of Technology into Higher Education Teacher Preparation Programs

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Abstract: This paper reports on a study of issues teacher educators face as they attempt to integrate technology into their instructional program: (1) the support they receive for use of technology, (2) their expectations of students to use technology, (3) their personal use technology, (4) their knowledge of national, state, and local technology standards and requirements, and (5) their integration of technology standards into their instructional practice. Areas of strength and areas of need for integration of ISTE Foundation Standards into teacher education programs were identified.

Introduction

Educational reform or restructuring has been a major theme in the United States for the last 30 years. Educators and others believe schools need to rethink the current system in light of the changes taking place in society (Gonzales & Roblyer, 1996). At the same time, ongoing research about teaching and learning has provided new knowledge and understanding of how people learn. Students no longer need to just learn how to memorize facts; they need to learn how to find and process information. A shift in the learning process from isolated individual work to collaborative work groups is needed. In this environment, knowledge is acquired from exploration and critical examination of information rather than primarily from teachers and textbooks. Technology, when used as a tool, has the capacity to help students solve problems, think independently and collaborate with others and plays an important role in the new methods of teaching and learning (Office of Technology Assessment, 1989; Sheingold, Martin, & Endreweit, 1987).

Research on effective use of computers as well as new knowledge about learning has led to changes in how computers are used in education. In the 1980s most teaching was about computer science topics, such as operating systems and programming. Computers were used mainly for drill and practice activities and/or electronic flash cards. In the 1990s when research showed technology had the greatest impact on student achievement when used in a collaborative, student-centered environment, the focus shifted to curriculum integration and the use of computers and technology as tools to support learning (Sheingold, Martin, & Endreweit, 1987).

A National Council for Accreditation of Teacher Education (NCATE) report suggests that new skills needed in the workplace have been a catalyst for K-12 schools to put an increased emphasis on using technology. An increased number of computers in the schools affect the culture of the school and traditional classroom practice. The report notes a decline of computer to student ratios from "50:1 in 1985 to 20:1 in 1990 to an estimated 9:1 in 1997" (NCATE Task Force on Technology and Teacher Education, 1997, p. 3). However, technology in schools is greatly underutilized (U.S. Congress, 1995).

In recent years, there has been growing recognition that changes in teacher preparation programs are needed to support education reform efforts, including the integration of technology into the curriculum. To adequately train teachers to use technology, it must be integrated into all aspects of the teacher preparation program. Because people teach the way they were taught, teacher educators need to change the way they teach and model appropriate use of technology (Goodlad, 1994). Faculty who integrate technology into their teaching and learning will be more productive while they will also be developing new models for teaching.

The International Society for Technology in Education (ISTE) developed technology program standards which include recommended Foundations in Technology for all Teachers (ISTE Foundation Standards) (Thomas, Friske, Knezek, Taylor, & Wiebe, 1997). The ISTE Foundation Standards are divided into three performance based components: (A) Basic Computer/Technology Operations and Concepts, (B) Personal and Professional Use of Technology, and (C) Application of Technology in Instruction (see Appendix B). The

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National Council for Accreditation of Teacher Education has adopted the ISTE Foundation Standards, along with the technology program standards (Thomas et al., 1997).

The National Council for Accreditation of Teacher Education (NCATE), the only national teacher education accreditation organization, adopted the ISTE technology standards as part of their accreditation standards. Two types of standards apply to the NCATE accreditation process: (1) curriculum guidelines and (2) unit guidelines for professional education programs. Schools/colleges of education seeking NCATE accreditation use the guidelines to "develop a folio that addresses the performance-based standards in each matrix" (Thomas et al. 1997, p. 1).

The NCATE Unit Guidelines are used to evaluate the integration of technology in teacher education programs. The ISTE Recommended Foundations in Technology for all Teachers can be used as guidelines for what teachers should know and be able to do, as well as, a guide for evaluating the technology component of teacher education programs. States have developed and continue to develop standards for teacher use of technology in education. Some states require evidence of performance of ISTE Foundation Standards to determine if graduates of teacher education programs are prepared to incorporate technology into their classrooms.

In 1997, NCATE took a more active role in the development of comprehensive technology guidelines. A Task Force on Technology and Teacher Education was convened to assist with "the development and implementation of technology expectations for teacher candidates and for accredited schools of education" (NCATE Task Force on Technology & Teacher Education, 1997, p. 3).

Method

Population

The population was 153 teacher educators who were integrally involved in preservice teacher education programs in 12 colleges/schools of education in two rural northwestern states.

Instrument

The Technology Integration in Teacher Education Instrument was developed by the researcher to collect information from teacher educators. The ISTE Recommended Foundations in Technology for all Teachers (Thomas et al., 1997) were used as a basis for development of the survey items. Additional questions were included to obtain demographic information and information about knowledge of technology standards. The report, *Teachers and Technology: Making the Connection* (U.S. Congress, 1995) was used to develop the support questions. The items were arranged in categories for clarity and in an order designed to encourage non-users of technology to respond.

The scales used in the section of the survey on technology issues were based on an instrument developed by the Northwest Regional Educational Laboratory for the Successful Schools Program. The instrument was designed to measure current status and to identify areas of strength and need. It utilized two related scales. The first scale, current status, indicated how the respondent currently rated each statement. The second scale, importance, indicated how important the respondent personally considered the item to be. Both scales gathered Likert type data (Ley & Nelson, 1990).

The instrument used in this study, a mail survey, was created by the researcher, judged and modified by three experts and other consultants. A pilot study was conducted prior to the collection of data.

The Northwest Educational Technology Consortium formatted the survey instrument, cover letter, and stamped self-addressed return envelope which were distributed to the population of full-time and part-time teacher educators at schools/colleges of education in two northwestern states between November 1, 1997 and January 4, 1998. Follow up correspondence to all non-respondents occurred in January and February 1998.

A total of 161 surveys were distributed by mail, eight of which were sent to people not included in the population. Seventy-two teacher educators responded. The response rate was 47.1%. Follow-up procedures were completed with a random sample of ten non-respondents.

Follow Up with Non-Respondents

Most researchers suggest that follow up measures be conducted if response rates are lower than 70% to 80% because of the likelihood that the lack of response could significantly alter the findings. A random sample of ten (12%) of the nonresponding group (n=83) was contacted by telephone interview. During the interview, a random sample of seven categorical items and six demographic items from the questionnaire were asked.

The answers to each of the question were compared with the responding group to determine whether the responding group responses were biased.

Method of Analysis of Data

Quantitative data analysis was performed using SPSS (version 6.1.1). The quantitative data were analyzed using non-parametric statistics. The Wilcoxon Matched-Pairs Signed-Ranks Test, a non-parametric test of two related samples was used.

Results

Description of Population

Most of the teacher educators in this study (over 70%) had used computers for more than ten years. The majority worked full time and held the rank of associate professor or professor. Forty percent had taught at the university level for more than ten years. In addition almost all had some teaching experience at the K-12 level. While their major teaching responsibilities were varied, the majority indicated they taught a combination of types of courses. This may indicate they are less able to incorporate technology into their teaching because of the need for differing strategies. The length of time they have been at the university may indicate that they are not aware of how technology is being used in the schools (U.S. Congress, 1995).

Areas of Strength

Areas of strength were found in use of technology to support personal productivity. Some of the more common applications of technology, word processing, communication, and on-line resources, were identified as significant areas of strength.

Personal use of technology included a wide variety of technology skills and concepts. When the high current status of use of word processing is taken into consideration, this could mean that teacher educators used and expected their students to use word processing for personal productivity and had lesser expectations in other areas. When people adopt a new technology, they tend to use it in the manner they used the technology they were replacing. Wetzel (1996-97) indicated that personal use of technology did not transfer to integration of technology into the classroom.

The other area of strength, access to a computer with Internet access, was identified as one of the highest overall on the current status scale. Earlier studies identified availability of computers with Internet access at work as an area of need (Willis, Austin, & Willis, 1994). However, the growth of the Internet and increasing ease of access seems to have helped to alleviate this deficiency as indicated by this study. Schools also seem to be moving in the direction of supporting this area.

Areas of Greatest Strength

Inventory item	n	IMP-CS
I have a computer with Internet access available at work for my use. (Q10)	72	-0.208 [a]
I expect my students to use word processing. (Q17)	72	-0.014 [a]
I use word processing for teaching and scholarship. (Q41)	72	-0.014 [a]
I use communication and on-line resources. (Q44)	71	0.084

[a] current status score greater than importance score, IMP=importance, CS=current status.
IMP-CS= mean of importance score minus mean of current status score for item.

Table 1: presents the greatest areas of strength as calculated by the difference of means for importance and current status. Four items were determined to be areas of strength. Three of the four had higher current status scores than importance scores.

Areas of Need

Areas of need have been divided into the following categories: support from university, integration into teaching, societal impact of technology, and use of standards. Areas of need tended to revolve around issues that support integration of technology into the classroom rather than use for personal productivity. Sixty percent, 27 of 45 items on the inventory were identified as significant areas of need. This indicates teacher educators and their students need to learn more before they can be considered technologically literate.

Support from university

Three of the seven items of greatest need dealt with support from the university. Teacher educators identified support from the university in areas of training, time, access to adequate hardware and software as one of their greatest needs for incorporation of technology into the program. To a lesser degree, they identified on-site technology support and a vision for how to use multimedia technology as significant areas of need. This finding agrees with earlier studies which rank support as a key component of integration of technology into the curriculum (Willis et al., 1995).

Integration into teaching

Expectations for students to use computers to support data collection, information management, problem solving, decision making, and access to information were also identified as areas of need. Computers and technology support student-centered learning. They have the greatest impact on student achievement when integrated into the curriculum and used as a tool to support learning. Computers and technology allow students to explore and analyze information (Caffarella, 1998).

Operation of multimedia computers and related peripheral devices, including imaging devices, and use of computers to create multimedia presentations are becoming common in schools. These were identified as areas of need for expectations of students. Many of the same skills and knowledge that were identified as areas of needs in expectations of students were identified as areas of need for teacher educators. Faculty may not have an awareness of the prevalence of these devices in the schools and their use.

Teacher educators need to become more proficient with use of multimedia computers and peripheral devices, including the use of imaging devices. They also identified a need to learn to install software and hardware and perform basic trouble shooting techniques. Even though most of the people surveyed had used computers for over ten years, they still did not feel confident in these areas. Willis et al. (1994) identified these as areas of need.

Distance education is becoming more common as access to and use of the Internet increases. Awareness of issues relating to distance education and its effect on education is another subject that is not often considered in schools of education.

Societal impact of technology

Another identified area of need was the importance of teacher educators to understand social, legal, and human issues. To a lesser degree, expectations of students to be aware of how computers and technology are used in society, was also identified as an area of need. The affect of technology on society and of society on technology is a topic found in science, social studies, and technology student standards (Caffarella, 1998). Since technology has changed society, it is important for teachers to understand these issues.

An existing need was identified for the items of personal awareness and expectations for students to demonstrate awareness of resources for adaptive assistive devices for students with special need. Both of these

items are often overlooked when considering technology. One of technology's greatest contributions has been in this area. With the emphasis on inclusion, teachers must have a greater awareness of technologies that will help all their students.

Expectations for students to have knowledge of equity, ethics, legal, and human issues concerning the use of computers and applications of distance learning were also identified as an area of need.

Use of standards

In the area of standards, teacher educators rated their current status of knowledge of standards rather high. The only significant area of need in this category was use of state and national standards in teaching. Evidence suggests (Wetzel, 1996-97) that when teachers use standards, student achievement increases.

Areas of Greatest Need

Inventory item	n	Z	p
I expect my students to demonstrate awareness of resources for adaptive assistive devices for student with special needs. (Q28)	72	-5.5109	.0000
My college/university provides the training I need so I can comfortably use computers and technology for teaching and scholarship. (Q14)	72	-5.4128	.0000
I am aware of resources for adaptive assistive devices for student with special needs. (Q37)	71	-5.2140	.0000
My college/university provides me enough time to use computers and technology for teaching and scholarship. (Q13)	72	-5.0438	.0000
I expect my students to observe demonstrations or uses of broadcast instruction, audio/video conferencing, and other distant learning applications. (Q30)	72	-4.7614	.0000
I am able to incorporate technology in my classes because my college/university provides access to adequate hardware and software. (Q15)	72	-4.5514	.0000
I expect my students to demonstrate knowledge of equity, ethics, legal, and human issues concerning use of computers and technology. (Q29)	72	-4.3708	.0000

Table 2: presents the seven items which were determined to be the greatest areas of need by their Z scores on the Wilcoxon Matched-Pairs Signed-Ranks Test. Three items deal with need for support from the university, three deal with expectations of students, and one deals with personal use of computers.

Conclusions

The use of self reported data and non-parametric statistics both limited the power of the study. Further limitations arose from the low response rate and the conflicting results of the non-respondent follow-up. Since the non-respondent sample seemed to have less experience with technology, their responses were probably due to lack of knowledge of the subject. Even with these limitations, it is still possible to use the findings to describe technology use in the teacher education programs.

(1) Teacher educators are proficient at using word processors and on-line communication. More emphasis is needed on the use of information management and problem solving applications, including spreadsheets, databases, and graphics.

(2) Teacher educators need much more support from their university to successfully shift from use of computers for personal productivity to integration of technology into their instruction.

(3) Teacher educators need opportunities to learn how to use multimedia computer applications to support student-centered learning including higher order thinking skills before they will be able to successfully integrate technology into their teaching.

(4) Teacher education programs should place a greater emphasis on the impact of technology on society and its implications for education.

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(5) To help teacher educators obtain a vision of how technology can be successfully integrated into instruction, models need to be developed, tested for effectiveness, and disseminated. More research is needed on types of technology use and methods of integration into instruction.
(6) For standards to have an impact, they must be incorporated into teaching.
(7) For technology to be integrated into teacher preparation programs, it must be a systemic effort, which includes collaboration by all parties: administrators, faculty, support personnel, and students.
(8) Research is needed to investigate student perceptions of use of technology and integration of technology standards into teacher preparation programs.

Perhaps one of the greatest benefits of this study was to expose teacher educators to the ISTE Foundation Standards and to provide a vision for areas of technology that had not been considered before.

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More information about the original study may be found at http://www.alaska.net/~mccoy/index2.htm.

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